



**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 25**

**[Docket No. FAA-2015-1483; Special Conditions No. 25-598-SC]**

**Special Conditions: Gulfstream Aerospace Corporation Model GVII-G500**

**Airplanes; Limit Engine Torque Loads**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Gulfstream Model GVII-G500 airplane.

These airplanes have a novel or unusual design feature as compared to the state of technology envisioned in the airworthiness standards for transport category airplanes. This design feature includes engine size and the potential torque loads imposed by sudden engine stoppage. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** The effective date of these special conditions is **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. We must receive your comments by **[INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

**ADDRESSES:** Send comments identified by docket number FAA-2015-1483 using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.
- *Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.

*Privacy:* The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the **Federal Register** published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

*Docket:* Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Walt Sippel, FAA, Airframe and Cabin Safety Branch, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057-3356; telephone 425-227-2774; facsimile 425-227-1232.

**SUPPLEMENTARY INFORMATION:**

The FAA has determined that notice of, and opportunity for, prior public comment on these special conditions are impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected airplane.

In addition, the substance of these special conditions has been subject to the public-comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon issuance.

**Comments Invited**

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive on or before the closing date for comments. We may change these special conditions based on the comments we receive.

**Background**

On March 29, 2012, Gulfstream Aerospace Corporation applied for a type certificate for their new Model GVII-G500 airplane.

The GVII airplane is a large-cabin business jet with seating for 19 passengers. It incorporates a low, swept-wing design with winglets and a T-tail. The Model GVII-G500

airplane is powered by two aft-fuselage-mounted Pratt & Whitney turbofan engines. Avionics will include four primary display units and multiple touchscreen controllers. The flight-control system is a three-axis fly-by-wire system controlled by active control/coupled side sticks.

The Model GVII-G500 airplane wingspan is approximately 87 ft with a length of just over 91 ft. Maximum takeoff weight will be approximately 76,850 lbs and maximum takeoff thrust will be approximately 15,135 lbs. Maximum range will be approximately 5,000 nm and maximum operating altitude will be 51,000 ft.

### **Type Certification Basis**

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.17, Gulfstream Aerospace Corporation must show that the Model GVII-500 airplane meets the applicable provisions of part 25, as amended by Amendments 25-1 through 25-137 thereto.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model GVII-G500 airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same or similar novel or unusual design feature, the special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Model GVII-G500 airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34 and the noise-certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type-certification basis under § 21.17(a)(2).

### **Novel or Unusual Design Features**

The Model GVII-G500 airplane will incorporate the following novel or unusual design features: Large-bypass engines capable of larger and more complex dynamic loads than were envisioned when the 14 CFR 25.361(b) rule was developed in 1957, thereby requiring issuance of special conditions to establish appropriate design standards for the Model GVII-G500 airplane.

### **Discussion**

The limit engine torque load imposed by sudden engine stoppage due to malfunction or structural failure (such as a compressor jamming) has been a specific requirement for transport-category airplanes since 1957. In the past, the design torque loads associated with typical failure scenarios have been estimated by the engine manufacturer and were provided to the airframe manufacturer as limit loads. These limit loads were considered simple, pure-torque static loads.

It is evident from service history that the engine-failure events that tend to cause the most severe loads are fan-blade failures, and these events occur much less frequently than the typical “limit” load condition.

To maintain the level of safety envisioned by § 25.361(b), more comprehensive criteria are required for the new generation of high-bypass engines. These special conditions distinguish between the more common engine-failure events and those rare events resulting from structural failures. The more-common events are regarded as static torque limit load conditions. The more-severe events resulting from extreme engine-failure conditions (such as loss of a full fan blade at redline speed) are regarded as full dynamic load conditions. These are considered

ultimate loads, and include all transient loads associated with the event. An additional safety factor is applied to the more-critical airframe supporting structure.

### **Applicability**

As discussed above, these special conditions are applicable to the Model GVII-G500 airplane. Should Gulfstream Aerospace apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

### **Conclusion**

This action affects only certain novel or unusual design features on one model series of airplane. It is not a rule of general applicability.

### **List of Subjects in 14 CFR Part 25**

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

### **The Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the Gulfstream Aerospace Corporation Model GVII-G500 airplane.

In lieu of § 25.361(b) the following special conditions apply:

1. For turbine engine installations, the engine mounts, pylons, and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the maximum limit torque loads imposed by each of the following:

- a. Sudden engine deceleration due to a malfunction that could result in a temporary loss of power or thrust, and
  - b. The maximum acceleration of the engine.
2. For auxiliary power unit (APU) installations, the power unit mounts and adjacent supporting airframe structure must be designed to withstand 1g level-flight loads acting simultaneously with the maximum limit torque loads imposed by each of the following:
  - a. Sudden APU deceleration due to malfunction or structural failure; and
  - b. The maximum acceleration of the APU.
3. For engine supporting structure, an ultimate loading condition must be considered that combines 1g flight loads with the transient dynamic loads resulting from:
  - a. The loss of any fan, compressor, or turbine blade; and separately,
  - b. Where applicable to a specific engine design, any other engine structural failure that results in higher loads.
4. The ultimate loads developed from the conditions specified in special conditions 3(a) and 3(b), above, are to be multiplied by a factor of 1.0 when applied to engine mounts and pylons, and multiplied by a factor of 1.25 when applied to adjacent supporting airframe structure.
5. Any permanent deformation that results from the conditions specified in special condition 3, above, must not prevent continued safe flight and landing.

Issued in Renton, Washington, on September 1, 2015.

Michael Kaszycki  
Acting Manager, Transport Airplane Directorate  
Aircraft Certification Service

